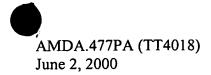
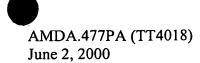


What is claimed is:

- 1 1. A method for analyzing a semiconductor die, the method comprising:
- 2 thermally coupling a heater having a plurality of heating elements therein to a
- 3 semiconductor die;
- 4 while operating the die, selectively controlling the heating elements and therein
- 5 causing at least one of the heating elements to heat at least one adjacent portion of the
- 6 die; and
- 7 analyzing the die via the operation and heating.
- 1 2. The method of claim 1, wherein operating the die includes running a test pattern
- 2 on the die suspected to cause a failure.
- 1 3. The method of claim 1, wherein operating the die includes electrically coupling
- 2 the die to a signal generator adapted to supply test signals to the die.
- 1 4. The method of claim 1, further including detecting that the die is
- 2 malfunctioning.
- 1 5. The method of claim 4, further comprising:
- 2 identifying the portion of the die being heated at the time that a malfunction is
- 3 detected; and
- 4 correlating the portion of the die being heated to a critical timing path.



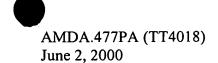
- 1 6. The method of claim 5, further comprising probing circuitry in the critical
- 2 timing path and determining therefrom the nature of a defect.
- 1 7. The method of claim 1, wherein the die includes at least one of: a flip-chip
- 2 bonded die and a wire-bonded die.
- 1 8. The method of claim 7, wherein the die is a wire-bonded die, and wherein
- 2 coupling the heater to the die comprises:
- 3 placing the heater on a die package;
- 4 placing the semiconductor die on the heater; and
- 5 wire-bonding the semiconductor die to the package.
- 1 9. The method of claim 8, further comprising electrically coupling the heater to the
- 2 package, wherein selectively controlling the heating elements includes applying an
- 3 electrical signal to the heater via the electrical coupling to the package.
- 1 10. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes causing the die to heat to a selected temperature.
- 1 11. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes heating a plurality of the heating elements in a selected sequence.



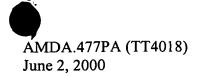
- 1 12. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes causing at least two of the heating elements to generate heat, and wherein the
- 3 at least two of the heating elements are located sufficiently distant from each other so
- 4 that heat from one of the elements does not interfere with heat from another one of the
- 5 elements in heating the die.
- 1 13. The method of claim 1, wherein selectively controlling the heating elements
- 2 includes causing the at least one heating element to generate pulses of heat.
- 1 14. The method of claim 1, wherein selectively controlling the heating elements
- 2 comprises:
- grouping the heating elements into selected groups, each group having two or
- 4 more heating elements;
- 5 causing the selected groups to heat in a sequence;
- detecting a response from the die that indicates that the die is operating
- 7 defectively; and
- 8 in response to detecting the defective operation, identifying the selected group
- 9 being caused to heat when the response is detected; and
- selectively operating individual heating elements of the selected group.
- 1 15. The method of claim 1, wherein selectively controlling the heating elements
- 2 comprises:
- detecting a temperature characteristic related to the heat being generated; and

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- 4 in response to the detected temperature characteristic, controlling the heating via
- 5 a feedback loop.
- 1 16. The method of claim 15, wherein detecting a characteristic of the heat being
- 2 generated includes detecting a temperature using a temperature sensor located in the
- 3 heater.
- 1 17. The method of claim 1, wherein analyzing the die includes detecting a response
- 2 from the die, further comprising storing the detected response in a computer
- 3 arrangement and using the stored response for analyzing the die.
- 1 18. The method of claim 1, wherein the die is a flip-chip die, further comprising,
- 2 prior to thermally coupling the heater to the die, thinning a back side of the flip-chip
- 3 die, and wherein thermally coupling the heater to the die includes coupling via the
- 4 thinned back side of the die.
- 1 19. A system for analyzing a semiconductor die, the system comprising:
- a plurality of heating means, arranged adjacent the die, for heating selected
- 3 portions of the die;
- 4 control means for selectively controlling the heating means and therein causing
- 5 at least one of the heating means to heat at least one adjacent portion of the die;
- 6 operating means for operating the die; and
- detection means for detecting a response from the die.



- 1 20. A system for analyzing a semiconductor die, the system comprising:
- a heating chip having a plurality of heating elements arranged adjacent the die
- 3 and adapted to heat selected portions of the die;
- 4 a controller adapted to selectively control the heating elements and therein cause
- 5 at least one of the heating elements to heat at least one adjacent portion of the die;
- a testing device adapted to operate the die; and
- 7 a detector adapted to detect a response from the die.
- 1 21. The system of claim 20, wherein each heating element includes at least one of:
- 2 resistive metal, a transistor, a diode, doped metal and a polysilicon trace.
- 1 (22.) The system of claim 20, wherein one of the heater elements includes a transistor
- 2 having a gate, and wherein the heater further comprises a temperature sensor coupled to
- 3 the base of the transistor and adapted to provide feedback to bias the gate, and therein
- 4 regulate the current through the transistor and control the heat generated.
- 1 23. The system of claim 22, wherein the temperature sensor includes at least one of:
- 2 a diode and a transistor.
- 1 24. The system of claim 20, further comprising a stage to hold the die and
- 2 electrically couple the die to the testing device.



- 1 25. The system of claim 20, further comprising a computer communicatively
- 2 coupled to the tester and adapted to control the tester.
- 1 26. The system of claim 25, wherein the computer is further communicatively
- 2 coupled to the controller and adapted to direct the controller's operation.
- 1 27. The system of claim 20, wherein the detector and the testing device are included
- 2 in a single arrangement.
- 1 28. The system of claim 27, further comprising a computer communicatively
- 2 coupled to the controller, the testing device, and the detector, and wherein the computer
- 3 is adapted to control the analysis of the die and to provide response results from
- 4 analysis for review by a user.
- 1 29. The system of claim 20, wherein the heater chip further comprises a control
- 2 register adapted to provide control signals to the heating elements.
- 1 30. A method for analyzing a semiconductor die, the method comprising using a
- 2 plurality of heating elements to selectively heat regions of an operating die and
- 3 analyzing the die therefrom.